possible, drains for its own use the entire cerebral activity.

Attention from the first has had a biological value.

"Any animal so organized that the impressions of the external world were all of equal significance to it, in whose consciousness all impressions stood upon the same level, without any single one predominating or inducing an appropriate motory adaptation, were exceedingly ill-equipped for its own preservation."

Attention has thus been a factor in the progress of life, or, as Prof. Ribot puts it epigrammatically, attention is a condition of life. In the lower animals, under normal conditions, attention is for the most part spontaneous; or, to use the author's alternative term, natural. One may perhaps say that in natural or spontaneous attention the motive or interest is inherent, while in voluntary or artificial attention it is extraneous. And the process by which voluntary attention is developed is by rendering attractive by artifice what is not attractive by nature; by giving an artificial interest to things that have not a natural interest. This, too, is a factor in progress; this, too, has a biological value.

"In the course of man's development from the savage state, so soon as (through whatever actual causes, such as lack of game, density of population, sterility of soil, or more warlike neighbouring tribes) there was only left the alternative of perishing or of accommodating oneself to more complex conditions of life—in other words, going to work—voluntary attention became a foremost factor in this new form of the struggle for existence. So soon as man had become capable of devoting himself to any task that possessed no immediate attraction, but accepted as only means of livelihood, voluntary attention put in an appearance in the world. It originated, accordingly, under the pressure of necessity, and of the education imparted by things external."

We have thought it more just to our author, and more satisfactory to our readers, to give some account of Prof. Ribot's main theses with which we are in full sympathy, than to select minor points, of which there are but few, in which we differ from his conclusions. The translation is, on the whole, satisfactory, but some expressions, such as "the marrow and the bulb" (for the spinal cord and medulla), "moderatory centres," and "the fundament of emotional life rests in tendencies," &c., strike one as somewhat unusual. C. LL. M.

OUR BOOK SHELF.

Handleiding tot de Kennis der Flora van Nederlandsch Indië: Beschrijving van de Families en Geslachten der Nederl. Indische Phanerogamen. Door Dr. J. G. Boerlage. Eerste Deel, Eerste Stuk. "Ranunculaceæ—Moringaceæ." Pp. 312. With an Index. ("Introduction to a Knowledge of the Flora of the Dutch East Indies." (Leyden: E. J. Brill, 1890.)

THIS is the first part of a work consisting of descriptions of the natural orders and genera of flowering plants represented in the Dutch East Indies. A work thus limited must necessarily be of limited utility; but we have Dr. Treub's testimony in a preface thereto that he regards it as a highly useful forerunner of a new Flora of the country. It is nearly five-and-thirty years since Miquel began publishing his "Flora," and the last part of it appeared in 1860, before Bentham and Hooker's "Genera Plantarum" commenced; and systematic botany generally has experienced extraordinary development since then. Further, one of the great advantages claimed for the present work is that it is wholly in Dutch. It is based on Bentham and Hooker's "Genera Plantarum," and we find on comparison that the ordinal, tribual, and generic definitions are to a great extent translations, though later additions to the flora, both in genera and species, have not been neglected. Dr. Boerlage's book will also be useful to the phytographer, as it is already something to have a synopsis of the genera found in the large eastern area under Dutch dominion. Geographically, the next descriptive "Flora" of the region should include the whole of "India aquosa," which means, at least, an examination of the plants of the whole of tropical Asia, of tropical Australia, and of Polynesia. Such a work, on lines similar to Hooker's "Flora of British India," would be of immense value; but it requires qualified men, with sufficient time, money, and ample materials from the whole area. W. B. H.

The Elements of Laboratory Work. By A. G. Earl, M.A., F.C.S. (London: Longmans, Green, and Co., 1890.)

THIS volume is of such a character that the reader is at once tempted to seek for its excellences rather than for its weak points. It aims at presenting "an introduction to all branches of natural science," and is intended to be used as a hand-book in the laboratories of public schools that have well-equipped rooms devoted to practical science. The author says in his preface that such rooms "are nowadays considered a necessary part of all public schools and colleges." Granting that this is the case, that the teacher is good, and that his pupils are already highly trained and anxious to learn pure science for its own sake, this volume might be accepted as an excellent guide. It is marked by a total absence of the "familiar examples" which we have hitherto associated with elementary scientific works. The student is made to accustom himself to technical language from the very first. For example, "a set of *weights*," is, on p. 2, explained as being "a number of bodies so arranged," &c.; and a few paragraphs further on the student is directed to "verify the graduation of a burette," and is introduced to reading telescopes and cathetometers. The first introduction of the student to chemical changes is an experiment consisting of the ignition of silver nitrate with quantitative observations, the second experiment is similar but with silver iodate, and the third is the heating of silver nitrate in a closed tube over a small Bunsen flame. In an explanation of the significance of what are commonly known as atomic weights and molecular weights, the expressions atomic masses and molecular masses are used. We do not see the advantage of this novel nomenclature. If the volume had an index, we should be prepared to recommend it in unqualified terms for the use of school-boys who can carry out such instructions as the following: "Perform experiments illustrating the law that chemical combination takes place between definite quantities of different kinds of matter."

Magnetism and Electricity. Part II. Voltaic Electricity. By Prof. Jamieson, M.Inst.C.E., &c. (London: Griffin and Co., 1890.)

IF the third part of this work prove equal in excellence to the two already published, Prof. Jamieson may claim to have produced one of the best introductory text-books on the subject. Like its predecessor, Part II. treats the subject in an essentially practical way. A competent electrician himself, the author is well able to understand the difficulties which beginners are likely to meet with, and his attempts to make obscure things clear will probably be found highly successful. The theoretical side of the subject is carefully considered, and no important application of a principle is passed over without reference.

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Instruments in actual use for what have now become every-day purposes are fully illustrated and described.

The book is well up to date both in the experimental and applied branches. Mr. Shelford Bidwell's apparatus for studying the changes in length of a bar during magnetization is described in such a way as to make the object of the experiment and the method of carrying it out easily understood. More of this kind of thing in our text-books is very desirable as showing that progress in a science is not made by chance, but is the outcome of careful thought on the part of patient investigators.

As a text-book for classes where experimental work is encouraged it is especially suitable, but we recommend it to the notice of all beginners. Numerous questions and specimen answers follow the various chapters, and an appendix gives instructions for making simple apparatus.

Astronomy with an Opera-Glass. By Garrett P. Serviss. (London and New York: D. Appleton and Co., 1889.)

WE are glad to welcome this, the second edition of a popular introduction to the study of the heavens. The author has surveyed, with the simplest of optical instruments, all the constellations visible in the latitude of New York, and carefully noted everything that seemed of interest to amateur star-gazers. In addition to the map and directions given to facilitate the recognition of the constellations and the principal stars visible to the naked eye, many facts are stated concerning the objects described which render the work a compendium of useful and interesting information—an astronomical text-book as well as a star-atlas. Similar combinations are very desirable introductions to every science, and offer the best means of extending true knowledge. To lead the student to Nature, and direct his attention to some of her marvellous works, to make him see natural phenomena intellectually, should be the basis of all scientific instruction, and works constructed on these lines read like story-books. With such works the one before us should be included, and there could hardly be a more pleasant road to astronomical knowledge than it affords; replete with information, elegant in design, easy of reading, and practical throughout, it deserves to rank high among similar guides to celestial phenomena. A child may understand the text, which reads more like a collection of anecdotes than anything else, but this does not mar its scientific value, and if the work multiplies the number of observers, as it is calculated to do, the dearest wish of every astronomer will be gratified.

LETTERS TO THE EDITOR.

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of* NATURE, *No notice is taken of anonymous communications.*]

Electrical Radiation from Conducting Spheres, an Electric Eye, and a Suggestion regarding Vision.

I DO not know how far the description of little isolated experiments is serviceable, but I am tempted to communicate a simple plan I use for exciting electric oscillations in dumb-bells, ellipsoids, elliptical plates, spheres, or other conducting bodies of definite geometrical shape unhampered by a bisecting spark-gap. I do it by supplying electricity to opposite ends of the conductor by means of Leyden jar knobs brought near enough to spark to it: said knobs being likewise connected with the terminals of a small Ruhmkorff coil. The charge thus supplied or withdrawn at every spark settles down in the conductor after a few oscillations, and these excite radiation in surrounding space.

There are many ways of arranging the Leyden jars: some more effective than others. The outer coats of the two jars may or may not be connected together. Connecting them in some cases brightens the sparks at short range, but seems to have a tendency to weaken them at long ranges. It is not difficult to surmise why this is so.

Of course, when the outer coats are disconnected, only an insignificant portion of the capacity of the jars is utilized; but unless the thing to be charged has too large a capacity it works perfectly well.

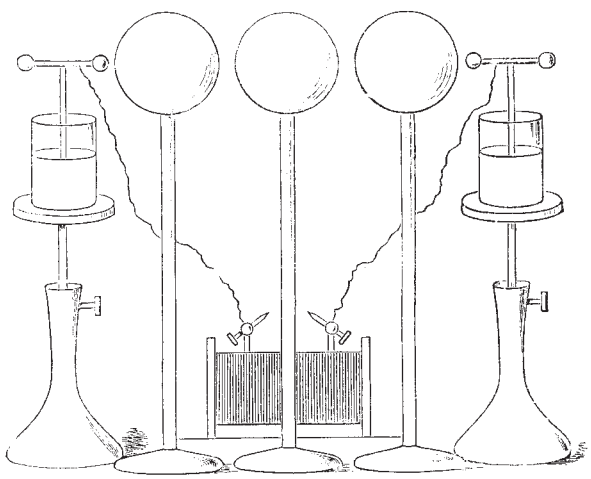
The receiver or detector is a precisely similar conductor touched to earth by a point held in the hand. The distance at which such a receiver responds is surprising. Or one may use a pair of similar conductors and let them spark into each other; but this plan is hardly so sensitive, and is more trouble.

The fact of being able in actual practice to get radiation from a sphere, is interesting, inasmuch as the subject of electrical oscillations in a perfectly conducting sphere has been worked out accurately by Prof. J. J. Thomson in the London Mathematical Society's Proceedings. I have not the volume by me, but I think he reckons the period of oscillation as the time required by light to travel 1·41 diameters of the sphere.

The case of spheres of ordinary metal will not be essentially different, with these rapid oscillations, for the electric currents keep to a mere shell of surface in either case; and in so far as *damping* affects the period, the dissipation of energy by radiation (which is common to both) is far greater than that caused by generation of heat in the skin of a metal sphere.

I happen to have four similar spheres of nickel-plated metal on tall insulating stems; each sphere 12·1 centimetres in diameter. Applying spark knobs to each end of a diameter of one of them, and applying the point of a penknife to another one standing on the same table at a distance of two and a half metres, I am able to get little sparks from it without using any reflector or intensifier.

Or arranging three spheres in a row, with intervals between and knobs outside, 5 short spark-gaps in all (see figure), and



using a fourth sphere as detector of this triple-sourced radiation, I draw little sparks from it to a touching penknife at a distance of 12 feet (366 centimetres, actual measurement).

In this case it may be a trifle better to hold one's hand near the receiving sphere at the side opposite to the penknife, and thus vary its capacity by trial so as to imitate the disturbing effect of the contiguous spheres in the transmitter.

The complete waves thus experimented on and detected are only 17 centimetres (six and a half inches) long, and I imagine are about the shortest yet dealt with.

But we do not seem near the limit set by lack of absolute suddenness in sparks yet, and are going on to try a large number of little globes.

Exciting a lot of little spheres by a coil in this way forcibly recalls to mind the excitation of a phosphorescent substance by a coil discharge.

And a receiver not very unlike the rod-and-cone structure of the retina can likewise be made. My assistant has been experimenting on a sort of gradated receiver which he made himself. I have recently had made a series of long cylinders with diameters ranging above and below 12 centims.; and the

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